WHAT IS CLAIMED IS:

1. A mammalian functional biosensor comprising mammalian G protein subunits fused to at least one of a cyan fluorescent protein and yellow fluorescent protein respectively and capably enabled for fluorescence resonance energy transfer.

2. A biosensor in accordance with Claim 1 wherein said subunits comprise G protein subunits.

3. A biosensor in accordance with Claim 1 wherein there are two subunits which comprise a mammalian G protein α subunit and a mammalian β or γ subunit.

4. A live functional G protein biosensor comprising a mammalian α subunit comprising a first amino acid sequence encoding at least one of a first fluorescent or a luminescent protein and at least one of a mammalian $\beta\gamma$ subunit complex comprising a second amino acid sequence encoding at least one of a second fluorescent and luminescent protein, wherein said first and said second fluorescent or luminescent proteins are at least FRET or BRET capable.

5. A biosensor in accordance with Claim 4 wherein said subunits comprise G protein subunits.

6. A biosensor in accordance with Claim 5 wherein said two subunits comprise a mammalian G protein α subunit and a mammalian β or γ subunit.

7. A screening method for screening natural or chemically synthesized candidate agonists and antagonists that bind to previously characterized, uncharacterized or "orphan" mammalian receptors, said method comprising operating an intact living cell containing said receptors and fluorescent protein tagged mammalian G protein α and $\beta\gamma$ subunit complex that are at least one of FRET capable and BRET capable which when reactively exposed to the said candidate agonists elicit a decrease in FRET signal and when subsequently exposed to an antagonist results in

an increase in the FRET or BRET signal thereby identifying candidate agonist(s) and antagonist(s) for said characterized, uncharacterized or orphan receptor.

8. A biosensor cell in accordance with Claim 7 wherein said living cell comprises receptors and G protein biosensor.

9. A method for determining signal transduction activity in a live mammalian cell system using FRET analysis, which comprises exposing a biosensor cell comprising a mammalian G protein coupled receptor and fluorescent protein tagged mammalian G protein subunits that are at least one of FRET and BRET capable, to agonists and antagonists to quantifiably measure G protein receptor signaling activity non-invasively in an intact mammalian cell.

10. A biosensor cell wherein said cell is living and comprises receptors and G protein biosensor.

11. A non-invasive method for identifying a candidate therapeutic drug molecule, which comprises obtaining a FRET output as a profile over a time period from a live biosensor cell comprising a mammalian alpha subunit comprising at least one of a first amino acid sequence encoding at least one of a first fluorescent and luminescent protein and a mammalian betagamma subunit complex comprising a second amino acid sequence encoding at least one of a second fluorescent protein and a luminescent protein, wherein said first and said second fluorescent or luminescent proteins are fluorescence resonance energy transfer capable and are expressed in cells containing a receptor or an orphan receptor (a) in the absence of an added candidate molecule, (b) in the presence of an added molecule and then comparing said FRET profile (b) with said FRET profile (a) to obtain a comparison of the FRET profile of (b) with the FRET profile of (a).

12. A biosensor cell in accordance with Claim 11 wherein said living cell comprises receptors and G protein biosensor.

13. A method in accordance with Claim 11 wherein if said comparison shows emitted FRET signal intensity after the addition of a candidate

molecule (b) is less than the FRET signal intensity before the addition of the candidate (a), then one classifies the molecule as an agonist candidate therapeutic drug molecule. If the comparison shows that said FRET profile (b) is similar to said FRET profile (a), then one classifies the molecule as a molecule likely not having agonistic therapeutic value.

14. A method in accordance with Claim 13 wherein a number of different molecules are added to said biosensor containing cells, singly or as a pool of various candidate molecules and FRET profiles of these candidate molecules are obtained to classify candidate therapeutic molecules.

15. A non-invasive screening method for identifying agonist candidate therapeutic drug molecules using an intact live biosensor cell system containing a receptor and a G protein biosensor, which when exposed to a candidate molecule results in reducing the intensity of said FRET signal indicating that said candidate is an agonist therapeutic drug molecule.

16. A biosensor cell in accordance with Claim 15 wherein said living cell comprises receptors and G protein biosensor.

17. A non-invasive screening method for identifying antagonistic activity of a candidate therapeutic drug molecule using an intact live biosensor cell system containing a receptor and a G protein biosensor, wherein exposure is made to a known agonist and subsequently to a candidate therapeutic drug molecule, said agonist being capable of binding to the said receptor, exposure results in the reduction of an emitted FRET signal, and then subsequent to binding of candidate therapeutic drug molecule results in an increase in the intensity of the FRET signal in comparison to the intensity of the FRET signal subsequent to the addition of the said agonist alone indicating that the said candidate is a therapeutic antagonist molecule.

18. A biosensor cell in accordance with Claim 17 wherein said live cell comprises receptors and G protein biosensor.

19. A non-invasive screening method for identifying natural or chemically synthesized candidate agonists and antagonists that bind to uncharacterized or "orphan" mammalian receptors thus de-orphaning orphan receptors, said method comprising an intact living biosensor cell containing the orphan receptor and fluorescent protein tagged mammalian G protein α subunit and $\beta\gamma$ complex subunit that are FRET capable which when reactively exposed to the candidate agonists when agonists bind to the receptor eliciting a decrease in an emitted FRET signal and when subsequently the same receptor contacts an antagonist results in an increase of the FRET signal identifying candidate agonist(s) and antagonist(s) for the said orphan receptor.

20. A method in accordance with Claim 19 wherein said method further comprises adding to the biosensor containing cells, a molecule known as an agonist to provide a FRET profile (c) and subsequently adding to biosensor a candidate therapeutic drug molecule which provides FRET profile (d) and comparing the FRET profile (d) with the FRET profile (c).

21. A biosensor cell in accordance with Claim 20 wherein the living cell comprises receptors and G protein biosensor.

22. A method in accordance with Claim 19 wherein if the FRET signal after the addition of a candidate molecule in FRET profile (d) is greater than the intensity of the FRET signal after the addition of the known agonist in profile (c), then one classifies the molecule added second as an antagonist candidate therapeutic drug molecule.

23. A method in accordance with Claim 19 wherein if the FRET signal after the addition of a candidate molecule in FRET profile (d) does not alter the FRET profile (c), then one classifies the added molecule is not an antagonist.

24. A method in accordance with Claim 19 wherein one or a number of different molecules are added to the biosensor containing cells, singly or as

a pool of various candidate molecules and FRET profiles of these candidate molecules are obtained to classify candidate therapeutic molecules.

25. A method for identifying a candidate therapeutic molecule as an inverse agonist by obtaining a FRET profile of a biosensor cell in accordance with Claim 1 containing overexpressed or mutant receptors of defined or orphan status possessing constitutive activity such that the FRET profile (e) is lower than FRET profile (a) from the biosensor cells expressing the same receptor without constitutive activity.

26. A method in accordance with Claim 25 for classifying a candidate molecule as an inverse agonist, wherein the cells that exhibit a profile (e) are exposed to candidate molecules and the resulting FRET profile (f) is compared with FRET profile (e).

27. A method in accordance with Claim 25 wherein if the FRET signal intensity is increased after addition of the candidate in profile (f) compared to the intensity of the signal in FRET profile (e), then the added molecule is classified as an inverse agonist candidate therapeutic drug molecule.

28. A method in accordance with Claim 25 wherein if addition of the candidate does not alter the FRET profile (e), then the added molecule is classified as not likely an inverse agonist.

29. A method in accordance with Claim 25 wherein a number of different molecules are added to the biosensor containing cells, singly or as a pool of various candidate molecules and FRET profiles of these candidate molecules are obtained to classify candidate therapeutic molecules.

30. A method in accordance with Claim 25 comprising an in vitro method comprising obtaining FRET profiles of partially or fully purified biosensor in the presence of partially or fully purified receptor protein of defined or orphan status and making comparisons of said FRET profiles with baseline FRET profiles.

31. A classification method for natural or chemically synthesized candidate agonists, antagonists and inverse agonist that bind to previously characterized, uncharacterized or "orphan" mammalian receptors, said method comprising operating an intact living insect cell where a mammalian G protein biosensor as well as receptors are expressed using a baculovirus vector and obtaining a FRET profile therefrom in the presence or absence of candidate therapeutic molecules and comparing these obtained FRET profiles to identify agonists, antagonists and inverse agonists for the receptors.

32. A method for increasing the number of receptor types that will couple to the biosensor by mutationally altering the C terminal tail of the alpha subunit constituent of the biosensor.

33. A method for altering the intensity of the FRET response from G proteins designed as biosensors by mutationally altering the intrinsic biochemical properties of the subunits that constitute the biosensor.

34. A method for altering the intensity of the response seen in the FRET profile to agonist, antagonist and inverse agonist molecules by mutationally introducing pertussis toxin insensitivity into the biosensor of Claim 1 and/or reducing the concentration of endogenous G protein subunits in cells containing the biosensor.

35. A live functional G protein biosensor cell or biosensor comprising a mammalian α subunit comprising a first amino acid sequence encoding a first fluorescent or luminescent protein is fused to a G protein coupled receptor and a mammalian β or γ subunit comprising a second amino acid sequence encoding a second fluorescent or luminescent protein, wherein the first and the second fluorescent or luminescent proteins are FRET capable and the addition of an agonist for the tethered receptor reduces the FRET signal intensity from these cells.

36. A biosensor cell in accordance with Claim 35 wherein the G protein α subunit tagged with a fluorescent protein is fused to a G protein coupled receptor.

37. A method of classifying candidate therapeutic molecules as agonists, antagonists or inverse agonist using the receptor-G protein biosensor cells expressing a fluorescent protein tagged α subunit tethered to a G protein coupled receptor and the fluorescent protein tagged $\beta\gamma$ complex and screening for predicted changes in the FRET profile from these cells in response to the addition of the candidate molecules.

38. A live functional G protein biosensor cell or biosensor comprising a mammalian alpha subunit comprising a first amino acid sequence encoding a first fluorescent or luminescent protein, and a beta subunit comprising a second amino acid sequence encoding a second fluorescent or luminescent protein, wherein the first amino acid sequence is fused to the second mammalian beta subunit comprising a second amino acid sequence encoding a second fluorescence or luminescent protein.

39. A method for identifying and classifying multiple candidate therapeutic molecules using the same G protein biosensor cell by repetitive treatment with agonistic and antagonistic compounds.

40. A method for identifying and classifying a single candidate therapeutic molecule using the same G protein biosensor cell by repetitive treatment with agonistic and antagonistic compounds.

41. A live functional biosensor cell or biosensor comprising a mammalian alpha subunit in which its carboxyl-terminal domain has been substituted with the corresponding domain of another α subunit with a distinctly different receptor specificity such that the biosensor cell can be used for screening for therapeutic molecules that are agonists, antagonists or inverse agonists of different receptor types.

42. A live functional biosensor cell or biosensor containing mutant forms of the G protein sensor that alter the receptor coupling capability of the G

protein such that it can be used for identifying and classifying therapeutic molecules which are agonists, antagonists or inverse agonists of various receptor types.

43. A method for identifying and classifying candidate therapeutic molecules which are agonists, antagonists or inverse agonists of various receptor types that have specific effects on cellular components including plasma membrane, intracellular organelles and cytosol using an intact functional G protein biosensor cell.

44. A method for identifying and classifying candidate therapeutic molecules which are agonists, antagonists or inverse agonists of various receptor types by performing high content screening of biosensor cells wherein 'high content' comprises information about biosensor activity in terms of both time dependence and spatial location in an intact cell maintaining structural and functional integrity.

45. A method of classifying candidate therapeutic molecules as agonists, antagonists or inverse agonists using biosensor cells expressing the fluorescent protein tagged alpha subunit fused to a second fluorescent protein tagged beta subunit with a gamma subunit and screening for predicted changes in the FRET profile from these cells in response to the addition of the candidate molecules.